Germination of Five Perennial Rhizome Grasses (*poaceae*) in Response to Na_2CO_3 Stress

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Key words: alkalinity stress, Songnen plain, seed germination, *Leymus chinensis*

Introduction The Songnen plain of China is one of the three largest areas of sodic soil in the world with 233.3×10^4 ha of sodic soil in which 90% of the salts in the surface soil are Na_2CO_3 and $NaHCO_3$. So far, few studies have focussed on the characteristics of the responses in seed germination to such stress. The main aim of this investigation is to study the seed germination responses of five drought-tolerant perennial rhizome grasses (*Elymus junceus*, *Festuca arundinacea*, *Agropygron elongatum*, *Leymus chinensis and Festuca rubra*) to variation in alkalinity.

Materials and methods Seeds of the five grass species were germinated on filter paper moistened with one of the following treatment solutions; 0, 25, 50, 75, or 100 mM Na_2CO_3. Seeds were placed in 9 cm Petri dishes containing one layer of filter paper moistened with 5 ml of treatment solution which was replenished as necessary. The germination temperature was 16/28℃ with 12 h dark/12 h light photoperiod for 14 d. After this treatment any non-germinated seeds were transferred to distilled water and given the opportunity to germinate over a further 14 d.

Results Germination percentages of all five species decreased as Na_2CO_3 concentration increased (Figure 1). *A. elongatum* was the most alkali-tolerant species with a germination percentage of 14.9% in 100 mM Na_2CO_3 whereas the other four species had no seed germinating at this concentration. When transferred to distilled water, seeds of *L. chinensis* germinated quickly and showed a positive relationship between germination percentage and the pre-transferred Na_2CO_3 concentration (Figure 2). However, germination in *A. elongatum* and *F. rubra* was poor and no germination occurred in *E. junceus* and *F. arundinacea* after transfer of seeds to distilled water.

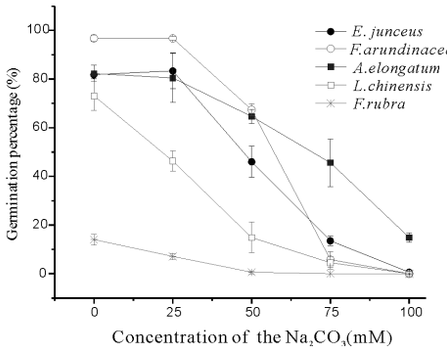

Figure 1 *Effects of different concentration Na_2CO_3 on the germination of the five grasses aer 14 d.*

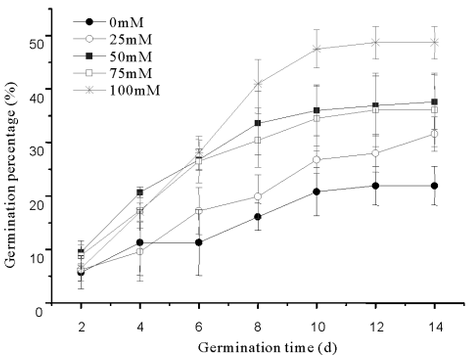

Figure 2 *Germination percentages of L. chinensis transferred to the distilled water.*

Conclusions These results indicated that *E. junceus*, *F. arundinacea* and *A. elongatum* have comparatively high germination at low alkalinity and *A. elongatum* is more tolerant to severe alkalinity. Seeds of *L. chinensis* can maintain viability upon exposure to salinity over 14d and then subsequently germinate when the stress is removed.

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